

**BY ORDER OF THE SECRETARY OF THE
AIR FORCE**

**AIR FORCE OCCUPATIONAL SAFETY AND
HEALTH STANDARD 48-14**

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Aerospace Medicine

***SWIMMING POOLS, SPAS AND HOT TUBS,
AND BATHING AREAS***

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This standard describes how the Air Force will operate and maintain swimming pools, public spas and hot tubs, and other bathing areas under its jurisdiction. It assigns responsibility for the healthful use and safe operation of bathing facilities and emphasizes the preventive medicine principles of hygiene and sanitation to ensure a clean, safe swimming and bathing environment. Address comments and suggestions to: Headquarters Air Force Medical Operations Agency (HQ AFMOA), 110 Luke Avenue, Room 400, Bolling AFB, DC 20332-7050. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

Chapter 1

RESPONSIBILITIES

1.1. HQ AFMOA/SGOE. Develops standards and guidance to ensure a clean, healthful and safe swimming, bathing, and workplace environment.

1.2. Installations.

1.2.1. Installation Commander. Responsible for the overall operation and maintenance of swimming pools and bathing facilities under Air Force jurisdiction.

1.2.2. Civil Engineer (CE).

- Constructs and maintains swimming pools, and public spas and hot tubs, as outlined in this standard, AFI 32-1066, *Plumbing Systems*, AFI 32-1067, *Water Systems*, and AFR 91-26, *Maintenance and Operation of Water Supply, Treatment and Distribution Systems* (to be superseded by AFMAN 32-1079, same title).
- Designates a competent, certified (where applicable), and responsible pool treatment plant operator.
- Ensures the pool operator maintains and operates pool equipment and keeps records as outlined in this standard.

1.2.3. Services (SV).

- Oversees the general day-to-day operation of public bathing facilities, in accordance with AFI 34-110, *Air Force Outdoor Recreation Programs*, and AFMAN 34-133, *Air Force Outdoor Recreation Program Procedures*, to provide patrons with sanitary and safe conditions and to provide a safe and healthful workplace for its employees.
- Appoints competent, certified, and responsible bathing facility personnel.

1.2.4. Public Health (PH).

- Performs routine facility sanitation inspections based upon locally developed criteria in accordance with AFI 48-117, *Public Facility Sanitation*.
- Performs epidemiological monitoring as an indicator of problems with bathing areas.
- Participates in pre-season, post-season, and other inspections, as necessary, of all such bathing areas, and submits recommendations to the installation commander and other responsible persons for the safe and sanitary operation and maintenance of the facilities.

1.2.5. Bioenvironmental Engineering (BE).

- Provides water quality supervision of swimming pools, spas and hot tubs, and natural bathing areas under Air Force jurisdiction.
- Participates in pre-season, post-season, and other inspections, as necessary, of all such bathing areas, and submits recommendations to the installation commander and other responsible persons for the safe and sanitary operation and maintenance of the facilities.
- Provides bacteriological monitoring in support of specific requests attributable to disease outbreaks.

- Provides industrial hygiene surveillance and recognizes these workplaces as part of the base occupational health program.

1.2.6. Life Guards.

- Know, understand, and enforce healthful pool practices and rules.
- Hold current lifesaving, first aid, and Cardiopulmonary Resuscitation (CPR) certifications in accordance with AFI 34-110 and AFMAN 34-133.
- Perform routine chemical determinations outlined in this standard.
- Complete the AF Form 708, **Swimming Pool Operational Log**, daily.

1.2.7. Bathing Facility Manager. Ensures sanitary upkeep of facilities and complies with this standard.

1.2.8. Bathing Facility Patrons. Follow the safety and cleanliness rules in this standard and any additional rules established by other responsible persons.

1.2.9. Ground Safety (SEG). Performs safety inspections of swimming pools, spas and hot tubs, and bathing areas.

Chapter 2

OPERATION AND MAINTENANCE

2.1. Swimming Pools.

2.1.1. Safety.

2.1.1.1. SV, BE, PH, and SEG shall jointly establish a set of rules, to include the following for compliance by pool patrons:

- Food and beverages prohibited on pool apron.
- Glass containers prohibited in pool area.
- Smoking prohibited on pool apron and in pool.
- Individuals with obvious evidence of a cold or other communicable disease, open sores or lesions, including fungal skin diseases, prohibited from entering pool.
- Children not toilet trained must wear snug-fitting plastic pants.
- Children 10 or younger must be under the direct supervision of an adult. Children 11 through 13 must pass a swim test or be supervised by an adult.
- Showers are required before entering pool.
- Lifeguards may clear pools or beach areas during electrical storms and at other times deemed necessary in the interest of safety.

2.1.1.2. SV shall:

- Clearly post a copy of these rules and this standard at the facilities for the lifeguards and patrons.
- Maintain the required safety and rescue equipment in accordance with AFI 34-110 and AFMAN 34-133.
- Clearly post a sign in the immediate vicinity of the pool area stating the location of the nearest telephone and indicating emergency telephone numbers.
- Clearly post signs requiring a shower for each user prior to entering the pool. These signs should be in a location where pool patrons will pass before entering the pool area.
- Calculate, post, and enforce maximum bather load. Estimate one bather per 25 square feet of swimming area and one bather per 10 square feet for non-swimming areas (water < 5 ft deep) (reference: Centers for Disease Control Standard 88-319--see **Attachment 1**).

2.1.2. Sanitation.

2.1.2.1. Bathing facility manager shall:

- If necessary, drain and clean recirculation filter pools before season opening and as recommended by the Medical Group Commander. Coordinate draining with the local authority or base wastewater treatment plant, as appropriate.
- Clean the pool daily with a suction cleaner or other bottom cleaning device.
- Drain and clean non-circulation wading pools with a 50 parts per million (ppm) chlorine solution daily, and as necessary.

- Clean toilet and shower facilities and dressing rooms daily. At least weekly, and as necessary, clean the shower and dressing room floors with a 50 ppm chlorine solution.
- Maintain a clean and healthful environment in and around the pool.

2.1.2.2. CE shall maintain a piping diagram of water and sewer lines and post a copy near the pool chemical equipment.

2.1.3. Water Quality.

2.1.3.1. The pool treatment plant operator shall ensure the pool water comes from an approved drinking water source and meets the guidelines in **Table 2.1.** and **Table 2.2.** The use of other disinfectants must be approved by MTF Commander. The use of silver-containing disinfectant systems are not authorized because some organisms develop a resistance to silver and bactericidal action is slow when compared to other methods (reference: Centers for Disease Control Standard 88-319--see **Attachment 1**). There is also a potential for silver ions to impact wastewater treatment plant discharges and sludges.

Table 2.1. Swimming Pool Water Quality Guidelines.

<i>PART A, TESTING BY BATHING FACILITY MANAGER/LIFEGUARD</i>			
Parameter	Frequency of Testing	Minimum	Maximum Comments
pH	Every 2 hours during operation	7.2	7.8
Free Chlorine Residual	Every 2 hours during operation	See table 2.2	2.0 ppm Minimum Residual depends on pH. DPD tablet #1 measures free chlorine residual.
Combined Chlorine	Every 2 hours during operation	None	0.2 ppm High levels indicated by sharp chlorinous odor, eye irritation, algae. DPD tablets #1 and #4 are required to measure combined chlorine.
Cyanuric Acid, if used	Biweekly	30 ppm	100 ppm Used in outdoor pools to stabilize free chlorine
Bromine, if used in place of chlorine	Daily	2.0 ppm	4.0 ppm DPD test can be used--multiply values by 2.25.
Iodine, if used in place of chlorine	Daily	0.5 ppm	1.2 ppm Not approved for outdoor pools
Temperature	Daily	None	82 °F
Total alkalinity, as CaCO ₃	Weekly	60 ppm	180 ppm
<i>PART B, TESTING BY CIVIL ENGINEERING PERSONNEL</i>			
Parameter	Frequency of Testing	Minimum	Maximum Comments
Calcium Hardness, as CaCO ₃	Monthly, or if indicated by other conditions	None	500 ppm Water should be balanced to prevent scale formation
Total Dissolved Solids	Bimonthly, or if indicated by other conditions	None	3000 ppm
Turbidity	When water appears cloudy; indicates need to shock treat	A black disc, 6" in diameter on a white field (Secchi disk) must be clearly visible on the bottom of the deepest part of the pool	

Table 2.2. Minimum Free Available Chlorine (FAC) Residual Versus pH.

pH	Minimum FAC stabilized with cyanuric acid (ppm)	Minimum FAC residual not stabilized (ppm)
7.2	1.00	0.40
7.3	1.00	0.40
7.4	1.00	0.40
7.5	1.00	0.40
7.6	1.25	0.50
7.7	1.50	0.60
7.8	1.75	0.70

2.1.3.2. The bathing facility manager shall ensure pools equipped with overflow gutters are overflowed each day to remove scum and surface debris. The water in pools equipped with only surface skimmers shall be maintained at a level such that the skimmer continuously operates.

2.1.3.3. Pool treatment plant operator shall shock treat (superchlorinate) the pool as necessary to correct poor water quality or kill algae. For chlorine, shock treat the pool by raising the total chlorine to 10 ppm. For other disinfectants, follow manufacturer's guidelines.

2.1.3.4. The following actions should be taken by pool operators upon discovering feces or vomit in the swimming pool.

- Notify patrons to exit the pool, and close the pool until corrective actions have been completed.
- Promptly remove physical debris with a pool net and continue skimming operations. Dispose of removed debris in latrine connected to sanitary sewer.
- Notify BE of the incident.
- Allow the appropriate disinfectant time to elapse or shock treat the pool by raising the chlorine level to 10 parts per million and waiting for chlorine to return to acceptable levels. BE will determine acceptable disinfection time by referencing Appendix 8 using free chlorine concentration and pH. Disinfection times are based on disinfection concentration-time values (CT_{99.9}) extracted from Title 40, Code of Federal Regulations, Part 141.74, and are rounded up to the nearest minute. Other methods must be approved by the MAJCOM Surgeon.
- Pool may be reopened after completion of the disinfectant time and when disinfectant levels can be maintained reliably at acceptable levels.

2.1.4. Measurements.

2.1.4.1. The bathing facility manager or lifeguards shall measure pH and disinfectant residual at all four corners of the pool at least once every two hours during operation, entering the average of the values on the AF Form 708. If results are outside the acceptable range indicated in **Table 2.1.** and **Table 2.2.**, contact BE and the pool treatment plant operator.

2.1.4.2. BE periodically determines the pH and disinfectant residual levels, enters the results on the AF Form 708, and compares the results to the life guard's readings. If the readings differ sig-

nificantly, BE shall determine the cause of the discrepancy and ensure the life guards are following the correct measurement procedures. BE shall determine the frequency of these measurements based on past performance history.

2.1.4.3. CE shall measure for those parameters indicated in **Table 2.1.** at intervals specified, making corrective actions to meet the guidelines or informing the facility manager of additional treatments recommended.

2.1.4.4. BE shall perform bacteriological sampling for Heterotrophic Plate Count (HPC) and Fecal Coliform (FC) within 72 hours prior to season opening and when pool related illnesses occur (**Attachment 5** gives common diseases of concern associated with pools and spas/hot tubs). HPC is a primary indicator of disinfection efficiency.

- HPC values greater than 200 Colony Forming Units per 1 milliliter or the presence of FC are potential indicators of poor water quality; however BE must conduct further evaluations to determine if a problem exists. Disturbances such as wind and rain within a day prior to sampling can cause HPC values to exceed 200 CFUs. Undisturbed, unoccupied pools should be able to remain less than or equal to 200 CFUs per 1 milliliter and free of FC prior to pool opening. The Medical Group Commander will determine whether pool water quality is acceptable if HPC values exceed 200 CFUs or if FC is present.
- HPC values exceeding 500 Colony Forming Units per 1 milliliter or FC values exceeding 4 colonies per 100 milliliters indicate poor water quality and require remedial actions to reduce HPC and FC values to acceptable levels prior to pool occupancy.
- The Medical Group Commander may establish more stringent or specific monitoring requirements. All bacteriological tests should follow procedures in *Standard Methods for the Examination of Water and Wastewater, Current Edition*. The use of certified laboratories for bacteriological analyses is not required if BE adheres to *Standard Methods*.

2.1.4.5. Current research and literature indicates routine bacteriological sampling of pool water is neither economical nor necessary. Water conditions may deteriorate more rapidly than regular monitoring would detect. In addition, if the water quality parameters are maintained as required in this standard, and regular shock treatment schedules are followed, illness outbreaks should be controlled. In almost all illness outbreaks that have been studied, presence of pathogens can be traced back to improper operation and maintenance or sub-standard water quality parameters (reference: Centers for Disease Control, various publications--see **Attachment 1**). **Attachment 5** gives information on illnesses Inspections. related to pool use.

2.1.5. Inspections.

2.1.5.1. A representative from CE, SV, BE, PH, and SEG shall conduct a joint pre-season inspection approximately 30 days prior to pool opening to ensure a safe and sanitary environment, and to allow time for corrective actions. For facilities operated continuously, the inspection should be about 30 days prior to heavy seasonal use. SV shall coordinate the inspection.

2.1.5.2. Within 30 days after seasonal closure, the CE, SV, BE, PH, and SEG representatives shall perform a joint post-season inspection to identify the extent of off-season maintenance needs. Early scheduling of maintenance will facilitate funding and completion of work in time for the next season. SV shall coordinate the inspection. For facilities operated continuously, no special inspection is required. The facility manager should conduct a survey six months after the 30 day inspection to identify any special repairs needed prior to the next heavy use season.

2.1.5.3. PH shall conduct periodic sanitary inspections of pool facilities. The frequency of inspection is determined by the Aerospace Medicine Council based upon past performance history. **Attachment 2** gives some inspection guidance.

2.1.5.4. BE shall ensure lifeguards are using proper testing procedures for pH and disinfectant residual measurements.

2.1.5.5. During periods of operation, representatives from CE shall at least weekly perform an inspection of the filtration, recirculation, and disinfection equipment to ensure its adequate function.

2.1.6. Chlorine Safety. BE and SE will determine the degree of protective equipment required when potential exposure to chlorine exists. The following summarize the minimum factors to consider when determining protective equipment requirements.

2.1.6.1. The potential for chlorine release exists whenever connecting and disconnecting containers to equipment. Occupational exposure to chlorine will be evaluated for all tasks in accordance with AFOSH Standard 48-8, *Controlling Exposures to Hazardous Materials*. Respirators will be selected and used in accordance with AFOSH Standard 48-1, *Respiratory Protection Program*.

2.1.6.2. Chlorinator facilities will be evaluated in accordance with AFOSH Standard 91-25, *Confined Spaces*, to determine applicability of requirements for a permit required confined space.

2.1.6.3. Chlorinator facilities will be evaluated for chlorine leaks prior to entry. The characteristic odor of chlorine makes its presence known at concentrations well below those which might injure persons exposed for brief periods. Because the odor of chlorine in itself is an inadequate indicator of concentration, it is essential that some quantitative measure of exposure be determined. Without adequate chlorine monitoring equipment sampling air in the vicinity of leaks, the use of self-contained breathing apparatus (SCBA) equipped with full face piece and operated in pressure demand or other positive pressure mode is required. Entry into facilities with an unknown chlorine concentration requires the use of SCBA equipped with full face piece operated in pressure demand or other positive pressure mode.

- Ideally, facilities will be equipped with adequate chlorine monitoring equipment sampling the air to determine the presence and magnitude of airborne chlorine levels.
- Leak detection can also be performed with ammonia. A small piece of cloth soaked with ammonia and wrapped around the end of a short stick can be used to detect leaks. Alternatively, a polyethylene "squeeze bottle" filled with ammonia may be used to direct ammonia vapor (not liquid) at potential leaks. If chlorine gas is leaking, a white cloud of ammonium chloride will form. This method of detection is not a quantitative method of detection. A SCBA equipped with full face piece and operated in pressure demand or other positive pressure mode is required in the presence of a leak unless other quantitative measurements are obtained and can be used to support selection of other respiratory protection.

2.1.6.4. An escape respirator should be selected in accordance with AFOSH Standard 48-1. The selected respirator shall be kept in a nearby controlled location, but not in the chlorinator equipment room.

2.2. Spas and Hot Tubs.

2.2.1. Safety.

2.2.1.1. Representatives from SV, BE, PH, and SEG shall jointly establish a set of rules, to include the following, for compliance by spa and hot tub patrons:

- Pregnant women; elderly persons; and persons suffering from heart disease, diabetes, or high or low blood pressure should not enter the spa/hot tub without prior medical consultation and permission from their doctor.
- Do not use the spa/hot tub while under the influence of alcohol, tranquilizers, or other drugs that cause drowsiness or that raise or lower blood pressure.
- Do not use at water temperatures above 104°F.
- Do not use alone.
- Unsupervised use by children prohibited.
- Enter and exit slowly.
- Observe reasonable time limits (10-15 minutes), then leave the water and cool down before returning.
- Long exposure may result in nausea, dizziness, or fainting.
- Glass containers and other breakables prohibited.
- Patrons should shower before and after using the spa/hot tub.
- No smoking.

2.2.1.2. SV shall:

- Post a copy of these rules which can be clearly read by personnel while sitting in the spa or hot tub. In addition, a copy of these rules and this standard shall be posted at the facilities for the manager or operator and patrons.
- Clearly post a sign in the immediate vicinity of the spa/hot tub stating the location of the nearest telephone and indicating emergency numbers.
- Ensure that at least one employee present has standard first aid and CPR certification, when feasible.
- Ensure the spa/hot tub operator is qualified in the operation of equipment, the procedure for performing the necessary water quality tests and safety checks.

2.2.2. Sanitation. The bathing facility manager shall:

- Maintain a clean and healthful environment in and around the spa/hot tub.
- Clean toilet and shower facilities and dressing rooms daily. At least weekly, and as necessary, clean the shower and dressing room floors with a 50 ppm chlorine solution.
- Ensure the spa/hot tub is shock treated daily by raising the total chlorine to 10 ppm or according to manufacturer's guidelines for other disinfectants.

2.2.3. Water Quality.

2.2.3.1. The bathing facility manager shall obtain water from approved drinking water supplies and ensure the water quality of the spa/hot tub meets the guidelines in **Table 2.3**. The use of other disinfectants must be approved by the Medical Group Commander. The use of silver-containing disinfectant systems are not authorized because some organisms develop a resistance to silver and

bactericidal action is slow when compared to other methods. There is also a potential for silver ions to impact wastewater treatment plant discharges and sludges.

Table 2.3. Spa and Hot Tub Water Quality Guidelines.

<i>PART A, TESTING BY BATHING FACILITY MANAGER/LIFEGUARD</i>			
Parameter	Frequency of Testing	Minimum	Maximum Comments
pH	Initially and every 1 hour during operation	7.2	7.8
Free Chlorine Residual	Initially and every 1 hour during operation	See table 2.4	5.0 ppm Minimum Residual depends on pH. DPD tablet #1 measures free chlorine residual.
Combined Chlorine	Initially and every 1 hour during operation	None	0.2 ppm High levels indicated by sharp chlorinous odor, eye irritation, algae. DPD tablets #1 and #4 are required to measure combined chlorine.
Cyanuric Acid, if used	Biweekly	10 ppm	100 ppm Not recommended for spas/hot tubs. Not needed in indoor or brominated tubs
Bromine, if used in place of chlorine	Daily	2.0 ppm	5.0 ppm DPD test can be used--multiply values by 2.25.
Iodine, if used in place of chlorine	Daily	Levels not confirmed	Consult local health officials before use.
Temperature	Daily	None	104 °F
Total alkalinity, as CaCO ₃	Weekly	60 ppm	180 ppm
<i>PART B, TESTING BY CIVIL ENGINEERING PERSONNEL</i>			
Parameter	Frequency of Testing	Minimum	Maximum Comments
Calcium Hardness, as CaCO ₃	Monthly, or if indicated by other conditions	None	500 ppm Water should be balanced to prevent scale formation
Total Dissolved Solids	Bimonthly, or if indicated by other conditions	None	3000 ppm
Turbidity	Cloudy water indicates the need to shock treat or drain and refill spa/hot tub.		

Table 2.4. Minimum Free Available Chlorine (FAC) Residual Versus pH For Spas/Hot Tubs.

pH	Minimum FAC residual (ppm)
7.2	2.00
7.3	2.00
7.4	2.00
7.5	2.00
7.6	2.50
7.7	3.00
7.8	3.50

NOTE:

Levels not established for systems using stabilizers. Follow manufacturer's guidelines or contact local health department. Stabilizer use is not recommended for spas/hot tubs.

2.2.3.2. The bathing facility manager shall ensure tubs are overflowed into the overflow gutter (if so equipped) or skimmed daily to remove scum and surface debris. Follow manufacturer's guidelines for skimming equipment.

2.2.4. Measurements.

2.2.4.1. The bathing facility manager shall measure pH, temperature, and disinfectant residual level prior to daily opening and hourly thereafter, or use a continuous reading device.

2.2.4.2. CE shall conduct water quality measurements at intervals specified in **Table 2.3.**, and others as necessary, making corrective actions at water supply or informing facility manager of additional treatments recommended.

2.2.4.3. BE shall periodically measure pH, temperature, and disinfectant residual level. BE shall determine the frequency of measurements based on past performance history.

Measurements should be made at times of heavy use.

2.2.4.4. Current research and literature indicates routine bacteriological sampling of spa/hot tub water is neither economical nor necessary. Water conditions may deteriorate more rapidly than regular monitoring would detect. In addition, if the water quality parameters are maintained as required in this standard, and regular shock treatment schedules are followed, illness outbreaks should be controlled. In almost all illness outbreaks that have been studied, presence of pathogens can be traced back to improper operation and maintenance or sub-standard water quality parameters. Bacteriological sampling is recommended in instances of illness outbreaks (reference: Centers for Disease Control, various publications--see **Attachment 1**). **Attachment 5** gives information on illnesses related to spa/hot tub use. *Standard Methods for the Examination for Water and Wastewater* details bacteriological sampling for recreational waters. The use of certified laboratories for bacteriological analyses is not required if BE adheres to *Standard Methods*.

2.2.5. Inspections.

2.2.5.1. Spa/Hot tub operators shall inspect the facilities, including disinfection equipment, once weekly and as necessary or recommended by the Medical Group Commander.

2.2.5.2. BE shall periodically inspect public spas/hot tubs to ensure water quality parameters are being met. BE shall determine inspection frequency based on past performance history. **Attachment 3** provides guidance for BE to perform pre-season, post-season, and routine inspections.

2.2.5.3. PH shall periodically inspect public spas/hot tubs to ensure proper safe and sanitary conditions around the spas and hot tubs. PH shall determine inspection frequency based on past performance history. **Attachment 3** provides inspection guidance.

2.3. Natural Bathing Areas.

2.3.1. Safety.

2.3.1.1. The Medical Group Commander shall approve all areas proposed for natural bathing facilities. The decision should be based on the following considerations:

2.3.1.1.1. Site Location. Ensure the bathing areas are free of the effects of point and nonpoint pollution sources. Sources of potentially dangerous contamination include waste discharges from communities, industries, marine craft, local animal populations, and water fowl. The water should meet the source water quality standards outlined in **Attachment 7**.

2.3.1.1.2. Type of Bottom. These areas should have bottoms which slope gently and uniformly toward deep water; have no holes or sudden step-offs; be free of hidden or submerged obstructions such as rocks, stumps, snags, and sunken logs; be composed of firm sand, small-sized gravel, or shale; have no silt, quicksand, shell patches, sharp and broken rock, or debris in depths of 5 ft (1.5 m) or less.

2.3.1.1.3. Physical Water Quality. Consider the depth and turbidity of the water, presence of currents, rip tides, and dangerous marine or aquatic life.

2.3.1.1.4. Common Diseases. Natural bodies of water located in areas where schistosomiasis (bilharziasis), leptospirosis, or primary amoebic meningoencephalitis are endemic shall not be approved for recreational purposes without the concurrence of the public health or preventive medicine officer. Special consideration must be given to the prevalence of the disease in the immediate locale and to the presence of disease-causative agents in the body of water.

2.3.1.2. SV, BE, PH, and SEG shall jointly establish safety and warning guidelines for hazards particular to the bathing area. For example, marine bathing beaches should warn swimmers of the possible presence of jellyfish, Portuguese man-of-war or other harmful aquatic life. SV shall clearly post signs with these safety and warning guidelines.

2.3.1.3. SV shall:

- Maintain a clean and healthful environment in and around natural bathing areas.
- If the area is to be guarded, comply with lifeguard requirements in accordance with AFI 34-110 and AFMAN 34-133.
- If the area is to be marked, clearly define and mark swimming areas and mark the outermost limits at regular intervals with buoys or similar devices, bearing signs warning all watercraft to keep out.
- Post signs on offshore floats or rafts indicating whether or not diving is permitted.
- Maintain the appropriate safety and rescue equipment in accordance with AFI 34-110 and AFMAN 34-133.
- Ensure emergency phone numbers are clearly posted near a dedicated emergency phone at the facility.

2.3.2. Sanitation. SV shall:

- Keep beach areas cleaned and raked at all times.
- Designate picnic areas near the beach and provide waste receptacles. Picnicking and bottles and cans for food and drink shall be prohibited on the beach proper.
- Ensure all beach toilets, shower facilities, and dressing rooms are kept clean and sanitary.

2.3.3. Water Quality.

2.3.3.1. Natural bathing areas present significantly more risks in terms of pathogenic organisms because the water is not treated chemically. Attachment 6 indicates diseases of concern related to natural recreational waters.

2.3.3.2. Fecal Coliform (FC) will be used as the indicator organism for evaluating the microbiological suitability of the water. Use the multiple-tube fermentation or membrane filter technique and compare results of at least five samples taken over fewer than 30 days. The FC content should not exceed a log mean of 200/100 ml, nor should more than 10 percent of the total samples during any 30-day period exceed 400/100 ml.

2.3.4. Measurements.

2.3.4.1. BE shall periodically take bacteriological samples for fecal coliform prior to season opening and for FC or other common pathogens based upon past history at the natural swimming area. All sampling shall follow guidance in *Standard Methods for the Examination of Water and Wastewater*, current edition. The use of certified laboratories for bacteriological analyses is not required if BE adheres to *Standard Methods*. If the local health department or other health/environmental agency routinely collects water quality samples, BE shall work with these agencies to share data to avoid duplication of sampling.

2.3.4.2. BE shall collect samples and have them analyzed for the contaminants listed in **Attachment 7** during the pre-season inspection. Periodically throughout the swimming season, BE should sample specifically for any contaminant with the potential to exceed acceptable limits based upon environmental conditions. These guidelines should assist in approving a site for use. If local or state regulatory agencies have current data, those data may be used and BE can determine what, if any, additional parameters need to be evaluated.

2.3.5. Inspections. Representatives from SV, BE, PH, and SEG shall conduct a pre-season survey of natural bathing areas. **Attachment 4** gives inspection guidance. PH shall periodically conduct a general inspection of the area and operations, as necessary, to ensure safe and sanitary conditions are being maintained.

2.4. Remedial Actions.

2.4.1. If bacteriological water quality of pools, spas/hot tubs, or natural bathing areas does not meet standards, BE shall:

- Collect repeat samples from the points of previous collection.
- Conduct an immediate investigation to determine if any unusual conditions such as repairs to facilities, storms, and so on might have caused a problem. For pools and spas/hot tubs, CE will determine if the filtration and disinfection systems have been operating properly.
- Ensure pH and disinfectant residuals are within acceptable ranges for pools and spas/hot tubs.
- Notify PH whenever conditions are encountered which may pose a health hazard to patrons.

2.4.2. If the results of the resample again exceed standards, the Medical Group Commander shall recommend closing the facility until the cause of the problem is determined. Shock treatment of pools and spas/hot tubs may be required.

2.4.3. PH will take any measures deemed necessary to initiate surveillance or investigate the occurrence of illnesses associated with unhealthy water quality.

2.5. General Considerations.

2.5.1. All facilities must comply with applicable state or local standards if they are more stringent. The Medical Group Commander may establish more stringent criteria for water quality testing and inspections than outlined in this standard.

2.5.2. All responsible parties shall ensure, where applicable, state or local standards and regulations are met.

2.5.3. Program Element Code 87705, Military Public/Occupational Health will be used to fund BE activities conducted to ensure compliance with this standard. These activities are not eligible for Environmental Compliance funding.

2.6. Forms Prescribed. This instruction prescribes AF Form 708, **Swimming Pool Operational Log**.

EDGAR R. ANDERSON, JR., Lt General, USAF, MC
Surgeon General

Attachment 1

GLOSSARY OF REFERENCES, ABBREVIATIONS, ACRONYMS, AND TERMS

References

AFI 32-1066, *Plumbing Systems*

AFI 32-1067, *Water Systems*

AFI 34-110, *Air Force Outdoor Recreation Programs*

AFMAN 34-133, *Air Force Outdoor Recreation Program Procedures*

AFOSH Standard 48-1, *Respiratory Protection Program*

AFOSH Standard 48-8, *Controlling Exposure to Hazardous Materials*

AFOSH Standard 91-25, *Confined Spaces*

AFR 91-26, *Maintenance and Operation of Water Supply, Treatment and Distribution Systems* (to be superseded by AFMAN 32-1079, same title)

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Abbreviations and Acronyms

AFI—Air Force Instruction

AFM—Air Force Manual

AFR—Air Force Regulation

AFMOA—Air Force Medical Operations Agency

ANSI—American National Standards Institute

BE—Bioenvironmental Engineering

CE—Civil Engineer

CT99.9—The product of residual disinfectant

CFU—Colony Forming Units

DPD—Diethyl-p-phenylenediamine

FAC—Free Available Chlorine

FC—Fecal Coliform

HPC—Heterotrophic Plate Count

MAJCOM—Major Command

MF—Membrane Filter

PH—Public Health

ppm—Parts per million (milligrams per liter)

SEG—Ground Safety Manager

SV—Services

Terms

Shall—Indicates a mandatory requirement.

Will—Is also used to indicate a mandatory requirement and in addition is used to express a declaration of intent, probability, or determination.

Should—Indicates a preferred method of accomplishment.

May—Indicates an acceptable or satisfactory method of accomplishment.

Attachment 2

SWIMMING POOL INSPECTION GUIDANCE

Regular inspections of pools should consider, as a minimum, the following (a negative response to any of the questions indicates the need for correction):

- Date of inspection and name of inspector(s) and pool operator.
- Copy of pool rules prominently displayed?
- Lifeguards enforcing pool rules?
- Cleaning requirements being followed?
- AF Form 708 properly completed?
- Water on apron draining away from pool?
- Water quality parameters (pH, Temp, disinfectant level, turbidity) being met?
- Pool surface water free of scum/debris?
- Pool bottom and sides clean? Vacuumed and scrubbed as needed?
- Proper first aid equipment present?
- Toilet/Shower facilities cleaned and disinfected as required?
- Phone readily available with emergency numbers clearly displayed?
- Is piping diagram of water and sewer lines posted near spa chemical equipment?

Attachment 3

SPA AND HOT TUB INSPECTION GUIDANCE

Regular inspections of spas and hot tubs should consider, as a minimum, the following (a negative response to any of the questions indicates the need for correction):

- Date of inspection and name of inspector(s) and operator.
- Copy of rules and warnings prominently displayed?
- At least 1 employee with documented first-aid training and CPR certification on duty?
- Operator enforcing rules?
- Cleaning requirements being followed?
- AF Form 708 properly completed?
- Water on apron draining away from spa/hot tub?
- Water quality parameters (pH, Temp, disinfectant level, turbidity) being met?
- Scum/debris removed from surface of water periodically?
- Bottom and sides clean?
- Proper first aid equipment present?
- Toilet/Shower facilities cleaned and disinfected as required?
- Phone readily available with emergency numbers clearly displayed?
- Is piping diagram of water and sewer lines posted near spa chemical equipment?

Attachment 4

NATURAL BATHING AREA INSPECTION GUIDANCE

Regular inspections of natural bathing facilities should consider, as a minimum, the following (a negative response to any questions indicates corrections needed):

- Examine for potential sources of pollution such as agricultural drainage or waste water discharges.
- Evaluate the bacteriological and chemical effects of such discharges on the bathing area.
- Water depth and bottom slope safe?
- Free of dangerous reptiles, submerged objects, drop-offs, or other physical endangerments?
- General cleanliness satisfactory for safety?
- Proper first aid safety equipment present?
- Safety guidelines prominently displayed and being followed and enforced by lifeguards?

Attachment 5

DISEASES OF CONCERN ASSOCIATED WITH POOLS, SPAS, AND HOT TUBS

Table A5.1. Diseases Associated With Pools, Spas, and Hot Tubs.

Diseases	Sources	Characteristics	Symptoms
1. Giardiasis	<u>Giardia lamblia</u> ; infected swimmers, usually young children, who contaminate the water through bowel movements	Gastrointestinal illness	Diarrhea, cramps
2. Otitis externa	<u>Pseudomonas aeruginosa</u> and various species of staphylococci; swimming pools with little or no disinfection	Very common infection; also called "swimmer's ear"	Itching, pain, and discharge of ear
3. Swimming pool granuloma or daphne sore	<u>Mycobacterium marinum (balnei)</u> ; a skin abrasion creates a portal of entry for the organism	Associated with concrete, gunite (spray concrete), or masonry pools; sites of infection tend to be knees and elbows from contact with rough surface of pool shell	Nodules on the skin that may ulcerate
4. Genital herpes	Herpes simplex virus (HSV); is not transmitted in water <u>but</u> can survive on plastic surfaces of a spa/hot tub	Contact with warm, moist environmental surfaces may lead to transmission	Genital Lesions
5. Follicular dermatitis	<u>Pseudomonas aeruginosa</u> ; rash is related to spa and hot tub use	Common sites of lesions are buttocks, hips, and trunk	Rash, itching
6. Pontiac Fever	<u>Legionella pneumophila</u> , serotype 6; can be transmitted by aerosols generated by the agitation of spa/hot tub water	Respiratory disease; self limiting	Fever, chills, malaise, and headache

Attachment 6

DISEASES OF CONCERN ASSOCIATED WITH NATURAL BATHING AREAS

Table A6.1. Diseases Associated With Natural Bathing Areas.

DISEASE	Sources	Characteristics	Symptoms
1. Leptospirosis	<u>Leptospira interrogans</u> ; water contaminated with urine from infected animals such as rats, swine, and cattle	Generally found in fresh water	Fever, chills, and headache
2. Giardiasis	<u>Giardia Lamblia</u> ; in the intestinal tracts of mammals such as beavers and foxes living near bathing areas	Gastrointestinal illness; generally found in fresh water	Diarrhea, cramps
3. Shistosome dermatitis, known as "swimmers itch" or "water rash"	Larvae of certain trematode worms of birds and mammals penetrate the skin	Common to freshwater lakes in the northcentral U.S.; can be prevented by limiting exposure to water to less than 30 minutes, followed by vigorous towel drying between fingers and toes	Dermatitis characterized by skin eruptions
4. Primary amoebic meningoencephalitis (PAM)	<u>Naegleria fowleri</u> ; a free-swimming amoeba associated with warm natural bodies of water	Common to southern U.S.; a parasitic disease untreatable with antiparasitic agents, antibiotics, and antimetabolites	Severe headache, fever, death
5. Schistosomiasis, also known as bilharziasis	<u>Schistosoma mansoni</u> (blood flukes); snails act as intermediate hosts for the cercariae, a larval form of the fluke; also found in parasite-infected drinking water, and other Schistosoma species	Serious public health disease found in fresh or mildly brackish water of tropical and semi-tropical areas such as Puerto Rico, the Philippines, the Middle East, Asia, and Africa (not found in marine environment)	Diarrhea, abdominal pain; liver and urinary disorders

DISEASE	Sources	Characteristics	Symptoms
6. Cryptosporidiosis	Cryptosporidium; a pathogenic intestinal protozoa found in man and animals which forms resistant oocysts; water contaminated through direct deposit of human and animal feces into receiving waters	Oocysts associated with turbid waters; ingestion causes gastrointestinal illness	Diarrhea

Attachment 7

RECOMMENDED SOURCE WATER QUALITY GUIDELINES

Table A7.1. Water Quality Guidelines.

Parameter	Criteria, ppm
Ammonia	0.5 (as N)
Arsenic	0.1
Barium	1.0
Cadmium	0.01
Chromium	0.05
Copper	1.0
Iron (soluble)	0.3
Lead	0.05
Manganese (soluble)	0.05
Mercury	0.002
Selenium	0.01
Sulfate	250
Zinc	5.0
Pesticides (EPA method 608)	
Aldrin	0.001
Chlordane	0.003
DDT	0.05
Dieldrin	0.001
Endrin	0.0005
Heptachlor	0.0001
Heptachlor epoxide	0.0001
Lindane	0.005
Methoxychlor	1.0
Organic phosphates plus	
carbamates	0.1
Toxaphene	0.005
Herbicides	
2,4-D	0.02
2,4,5-T	0.002
2,4,5-TP (Silvex)	0.03
Phenols	0.001

Attachment 8

DISINFECTION TIMES TO REACH ACCEPTABLE INACTIVATION OF BACTERIA, VIRUS AND GIARDIA LAMBLIA CYSTS

Table A8.1. Disinfection Times.

	pH < or =		
Free < or = (mg/l)	7.0	7.5	8.0
0.4	<i>88 min</i>	<i>105 min</i>	<i>125 min</i>
0.6	<i>60 min</i>	<i>72 min</i>	<i>85 min</i>
0.8	<i>47 min</i>	<i>55min</i>	<i>67 min</i>
1.0	<i>37 min</i>	<i>45 min</i>	<i>54 min</i>
1.2	<i>32 min</i>	<i>39 min</i>	<i>46 min</i>
1.4	<i>28 min</i>	<i>34 min</i>	<i>41 min</i>
1.6	<i>25 min</i>	<i>30 min</i>	<i>37 min</i>
1.8	<i>23 min</i>	<i>28 min</i>	<i>34 min</i>
2.0	<i>22 min</i>	<i>25 min</i>	<i>31 min</i>
2.2	<i>20 min</i>	<i>24 min</i>	<i>29 min</i>
2.4	<i>18 min</i>	<i>22 min</i>	<i>27 min</i>
2.6	<i>17 min</i>	<i>21 min</i>	<i>25 min</i>
2.8	<i>16 min</i>	<i>20 min</i>	<i>24 min</i>
3.0	<i>16 min</i>	<i>19 min</i>	<i>23 min</i>